National Semiconductor

MICROCIRCUIT DATA SHEET

MN54AC14-X REV 2A0

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Hex Inverter Schmidt Trigger

General Description

The AC14 contains six logic inverters which accept standard CMOS output levels. They are capable of transforming slowly changing input signals into sharply defined, jitterfree output signals. In addition they have a greater noise margin than conventional inverters.

The 'AC14 has hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

Industry Part Number

54AC14

NS Part Numbers

54AC14DMQB
54AC14FMQB
54AC14LMQB

Prime Die

Z014

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{o}C)
1	Static tests at	+25 C
2	Static tests at	+125C
3	Static tests at	-55 C
4	Dynamic tests at	+25 C
5	Dynamic tests at	+125C
6	Dynamic tests at	-55 C
7	Functional tests at	+25 C
8A	Functional tests at	+125C
8B	Functional tests at	-55 C
9	Switching tests at	+25 C
10	Switching tests at	+125C
11	Switching tests at	-55 C

Features

- ICC reduced by 50%
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
  - AC14:5962-87624

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage (Vcc)	-0.5V to 7.0V
DC Input Diode Current (Iik)	
Vi = -0.5V	-20 mA
Vi = Vcc +0.5V	+20 mA
DC Input Voltage (Vi)	-0.5V to Vcc +0.5V
DC Output Diode Current (Iok)	
Vo = -0.5V	-20 mA
Vo = Vcc +0.5V	+20 mA
Storage Temperature (Tstg)	-65 C to +150 C
DC Output Voltage (Vo)	-0.5V to Vcc +0.5V
DC Output Source or Sink Current (Io)	$\pm$50 mA
DC Vcc or Ground Current per Output Pin (Icc or Ignd)	$\pm$50 mA
Junction Temperature (Tj)	
CDIP	175 C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specification should be met, without exception, to ensure that the system design is reliable over its power supply temperature, and output/input loading variables. National does not recommend operation of FACT TM circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (Vcc)	2.0V to 6.0V
Input Voltage (Vi)	0V to Vcc
Output Voltage (Vo)	0V to Vcc
Operating Temperature (Ta)	-55 C to +125 C

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC=3.0V to 5.5V, Temperature Range: -55 C to 125 C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High level input current	VCC=5.5V, VM=5.5V	1, 2	INPUT		0.1	uA	1
			1, 2	INPUT		1.0	uA	2, 3
IIL	Low level input current	VCC=5.5V, VM=0.0V	1, 2	INPUT		-0.1	uA	1
			1, 2	INPUT		-1.0	uA	2, 3
VOL	Low level output voltage	VCC=3.0V, VIH=2.1V, IOL=12.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=3.0V, VIH=2.1V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=4.5V, VIH=3.15V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=4.5V, VIH=3.15V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=5.5V, VIH=3.85V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=5.5V, VIH=3.85V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
VIOL	Dynamic Output Current LOW	VCC=5.5V, VIH=3.85V, IOL=50.0mA	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High level output voltage	VCC=3.0V, VIL=0.9V, IOH=12.0mA	1, 2	OUTPUT	2.56		V	1
			1, 2	OUTPUT	2.40		V	2, 3
		VCC=3.0V, VIL=0.9V, IOH=50.0uA	1, 2	OUTPUT	2.90		V	1, 2, 3
		VCC=4.5V, VIL=1.35V, IOH=24.0mA	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=4.5V, VIL=1.35V, IOH=50.0uA	1, 2	OUTPUT	4.40		V	1, 2, 3
		VCC=5.4V, VIL=1.65V, IOH=50.0uA	1, 2	OUTPUT	5.40		V	1, 2, 3
		VCC=5.5V, VIL=1.65V, IOH=24.0mA	1, 2	OUTPUT	4.86		V	1
			1, 2	OUTPUT	4.70		V	2, 3
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VIL=1.65V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
ICCH	Supply Current Outputs HIGH	VCC=5.5V, VINL=0.0V	1, 2	VCC		2.0	uA	1
			1, 2	VCC		40	uA	2, 3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC=3.0V to 5.5V, Temperature Range: -55 C to 125 C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCL	Supply Current Outputs LOW	VCC=5.5V, VINH=5.5V	1, 2	VCC		2.0	uA	1
			1, 2	VCC		40	uA	2, 3
VTP	Maximum Posistive Threshold	VCC=3.0V	1, 2	INPUT		2.2	V	1, 2, 3
		VCC=4.5V	1, 2	INPUT		3.2	V	1, 2, 3
		VCC=5.5V	1, 2	INPUT		3.9	V	1, 2, 3
VTM	Minimum Negative Threshold	VCC=3.0V	1, 2	INPUT	0.5		V	1, 2, 3
		VCC=4.5V	1, 2	INPUT	0.9		V	1, 2, 3
		VCC=5.5V	1, 2	INPUT	1.1		V	1, 2, 3
VHYS	Hysteresis	VCC=3.0V	1, 2, 7	INPUT	0.3	1.2	V	1, 2, 3
		VCC=4.5V	1, 2, 7	INPUT	0.4	1.4	V	1, 2, 3
		VCC=5.5V	1, 2, 7	INPUT	0.5	1.6	V	1, 2, 3

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, RL=500 OHMS, TRISE & TFALL=3ns, Temp Range: -55C to +125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH(1)	Propagation Delay	VCC=4.0V	3, 4, 6	In to $\overline{O}$	1.5	10.0	ns	9
			3, 4, 6	In to $\overline{O}$	1.5	12.0	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.0V	3, 4, 6	In to $\overline{O}$	1.5	8.5	ns	9
			3, 4, 6	In to $\overline{O}$	1.5	10.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC=3.0V	3, 4, 6	In to $\overline{O}$	1.0	13.5	ns	9
			3, 4, 6	In to $\overline{O}$	1.0	16.0	ns	10, 11
tpHL(2)	Propagation Delay	VCC=3.0V	3, 4, 6	In to $\overline{O}$	1.0	11.5	ns	9
			3, 4, 6	In to $\overline{O}$	1.0	14.0	ns	10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C TEMPERATURE, SUBGROUPS 1, 2, 7, & 8.
Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A1, 2, 7, & 8.
Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY SUBGROUP A9.
Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A9 & 10.
Note 5: TRANSMISSION LINE DRIVING TEST, GUARDBAND LIMITS SET FOR +25C, 2 MSEC DURATION MAX.
Note 6: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MIN. LIMITS.
Note 7: VHYS IS NOT MEASURED BUT CALCULATED USING VHYS=VTP-VTM.

Revision History

Rev	ECN #	Rel Date	Originator	Changes
2A0	M0004333	09/29/03	Rose Malone	Update MDS: MN54AC14-X, Rev. 1B0 to MN54AC14-X, Rev. 2A0. Deleted reference to Minimum Input Edge Rate (Delta V/Delta t) from Recommended Operating Conditions Section.